THE RELATIVE VALIDITY OF SAT SCORES AND HIGH SCHOOL GPA AS PREDICTORS OF EARLY COLLEGE SUCCESS AT CONNECTICUT STATE COMMUNITY COLLEGES AND UNIVERSITIES

SUMMARY

The current study leveraged Connecticut's Preschool through Twenty and Workforce Information Network (P20 WIN) to generate a sample of 11,619 Connecticut Community College (CCC) students and 7,675 Connecticut State University (CSU) students who attended public high school in Connecticut. The authors conducted correlational and regression analyses to investigate the predictive power of SAT scores and high school GPA (HSGPA) on three early college outcomes: (a) first-year retention, (b) first-year college math, and (c) first-year English GPAs. Results revealed that, for both CCC and CSU students, HSGPA was a stronger correlate of early college success outcomes than either SAT-ERW or SAT-Math. This held true for the samples overall, as well as within ethnicities, and while controlling for demographic factors. Last, SAT-Math proved a stronger predictor of retention than SAT-ERW, and added predictive value to success models, albeit less so than HSGPA.

INTRODUCTION

In recent years, the utility of the SAT for predicting college success has been questioned, with other measures of academic quality, such as HSGPA and class rank, put forward as substitutes for college admissions decisions. Racial disparities in SAT performance, in which White and Asian students outperform Black and Hispanic students, have been observed for many decades, and continue to this day.[1] Given that standardized test scores correlate robustly with family income, and have a significantly stronger relationship with income than HSGPA does,[2, 3] it has been suggested that such scores are in fact more indicative of socio-economic status than of true academic ability. Furthermore, some research has shown that standardized tests have greatest predictive ability for White student populations and fall short when predicting success for Black and Hispanic students.[4]

The most commonly proposed replacement for standardized test scores is HSGPA. Despite the seeming subjectivity of teacher-assigned grades and the recent trend for grade inflation, the predictive utility of HSGPA for subsequent academic achievement has been described as "among the sturdiest findings in social science."[5] Not only is HSGPA strongly related to college grades,[6, 7] college retention,[6, 7] college graduation,[7-9] but it even correlates with occupational prestige and income level after college.[10] Indeed, considerable research has confirmed the preeminence of HSGPA as a high-quality predictor of college success.

Why does HSGPA seem to predict college outcomes so reliably? Experts believe there are several reasons. First, in contrast to standardized tests, which have scores based on a single timepoint, a GPA is an average of dozens of grades that take years to achieve, each based on multiple tests, projects, and assignments. Furthermore, success in college requires a constellation of abilities that might not be easy to assess by a test: perseverance, strong communication skills, and organization are some skills that may contribute to consistently high grades. One possibility is that high school courses require these noncognitive skills to a greater degree than standardized tests do. Galla and colleagues identified self-regulation as the capability that underlies the strong relationship between HSGPA and college success. Self-regulation can be thought of as a set of goal-directed competencies including

self-control, grit, and self-regulated learning.[5] While self-regulation underlies the relationship between HSGPA and college success, the authors identified cognitive ability as the competency underlying the relationship between standardized admissions test scores and college success.

The news is not all bad for SAT scores. Many studies have found that, although they might not be the strongest predictor of college success, they still have a reliably positive correlation with college outcomes, including college GPA, retention, and graduation. Often, these positive relationships remain even after controlling for socio-economic status.[11] And, a large-scale study of over 200,000 first-year college students has shown that SAT scores are valuable for predicting first-year college grades and retention, even after controlling for HSGPA.[12]

As reviewed above, high school indicators of academic quality such as SAT scores and HSGPA can be extremely important for chances of college entry (especially at selective institutions), success and persistence during college, and even post-college success. In addition, these quality metrics are often used to determine course placement for key college courses. This is particularly common for deciding whether a student should be placed in developmental, introductory, intermediate, or advanced Math or English classes. If placed in a developmental course, these decisions can mean a student takes more courses than their peers. Alternately, a student may be able to meet degree requirements more quickly, if placed in a more advanced course initially. As such, it is crucial that these placement decisions be as accurate as possible: taking even one unnecessary course can cause a significant burden to students in terms of both time and cost. In fact, among students who take more than one remedial course, very few ever complete a college-level course in that subject.[13]

Given the high stakes of academic quality metrics, we sought to assess how closely academic quality predictors (1) SAT scores and (2) HSGPA aligned with three measures of college outcomes: (a) first-year college Math GPA, (b) first-year college English GPA, and (c) number of college semesters attended. We also investigated these relationships separately by ethnicity, to investigate possible differences in the strength of correlations between SAT scores and early college success for students of different race and ethnicity backgrounds. Last, we used logistic regression to explore the predictive value of both HSGPA and SAT scores on retention, while controlling for each academic quality predictor as well as for demographic factors of gender, ethnicity, and Free-or-Reduced-Price Lunch (FRPL) status. This allowed us to examine the unique contribution of HSGPA and SAT scores while holding constant other potentially related factors.

This study was conducted using data requested through P20 WIN, which is a statewide collaboration that seeks to facilitate secure data sharing among CT state agencies, including Connecticut State Colleges & Universities (CSCU) and the Connecticut State Department of Education (CSDE). In particular, we were able to join high school information and postsecondary school data for every public high school student who graduated during the study period and attended CSCU. Because all Connecticut public high school students are required to take the SAT in 11th grade, we were able to obtain SAT scores for both university and community college populations. As such, the P20 WIN framework enabled the researchers to investigate the relationship between SAT scores and early college performance among community college students, a population whose SAT scores are traditionally not available to higher education researchers.

THE CURRENT RESEARCH

Population

The P20 WIN data for the current request was collected in the Spring of 2019, and two years of post-high school data were required to generate the first-year GPA and retention metrics. As such, the high school class of 2017 was the latest one that could be included, as they would have approximately two years of possible college attendance to draw from at the time of data collection. Due to incomplete grade data for earlier cohorts, the

earliest high school class year that could be included was 2015. Therefore, the population included students from three high school graduating classes: those graduating in 2015,2016, and 2017.

The final sample included 7,675 CT State University (CSU) students and 11,619 CT Community College (CCC) students who graduated from a public high school in Connecticut between 2015 and 2017, inclusive. Other criteria for inclusion were: (a) attending a CCC or CSU after high school graduation, (b) taking at least one math or English course during their first year at a CCC or CSU, and (c) having both a HSGPA and SAT score available. In the case that a student took math and/or English at both a CCC and a CSU, their data were used in both populations. Taking at least one course at both a CCC and a CSU applied to 1,287 students.

Predictor Variables

HSGPA: HSGPA was calculated from course grade data supplied from the CSDE. Plus and minus grades (e.g., "A+", "B-") were simplified to single-character grades (e.g., "A", "B"). The rationale was that not all schools and districts assigned plus and minus grades, and a consistent conversion to a numeric scale was not possible. Grades from schools and districts that supplied numeric grades (e.g., "85") for courses were converted to letter grades as follows: 90-100= A; 80-89.9 = B; 70-79.9 = C; 60-69.9 = -D, 59.9 and below = F. Finally, letter grades were converted to the standard 4-point scale, weighted by number of credits, and averaged to obtain a GPA.

SAT Scores: SAT Evidence-Based Reading and Writing (SAT-ERW) and SAT Math (SAT-M) scores were obtained from two sources. The default source was the score reported to the college or university attended. If no score was reported to the student's college or university, we used the scores provided by the CSDE. In the case that the CSDE reported multiples scores, we took the highest. The majority of the scores provided by the CSDE were 11th grade scores from SATs mandated for each student.

Outcome Variables

First-Year Math GPA: If a student took one or more math courses at a CCC or CSU during their first two terms of attendance, we derived a First-Year Math GPA (FYMGPA). These courses could be either developmental or college-level.

First-Year English GPA: If a student took one or more math courses at a CCC or CSU during their first two terms of attendance, we derived a First-Year Math GPA (FYMGPA). These courses could be either developmental or college-level.

Number of Semesters Attended. We used a data match from the National Student Clearinghouse to count the number of semesters a student attended during the 2-year period following high school graduation. Because community college, and even university, students often transfer to other institutions during their education, we used data from the National Student Clearinghouse to capture all college enrollment, even enrollment occurring outside of CSCU.

At the time of data collection, enrollment was available for a maximum of six college semesters for the latest cohort (high school class of 2017). Specifically, students graduating high school in the spring of 2017 could have enrolled in college during the Summer 2017, Fall 2017, Spring 2018, Summer 2018, Fall 2018, and/or Spring 2019. As such, we limited our college semester count for students from any cohort to the first two years following high school graduation, to allow for a maximum of six possible semesters attended after high school for all students in the sample.

The National Student Clearinghouse includes data from many different types of institutions throughout the United States. As such, the definition of a "semester" is not standardized. Therefore, we used the following

process to ensure that semester counts were comparable between students whose institutions offered 3 semesters per year and those whose institutions offered more and shorter semesters:

- A semester had to be longer than 10 days to count.
- Students were limited to 3 semesters per calendar year. Therefore, if a student enrolled, for example, in Spring, two shortened Summer Semesters, and Fall in a given calendar year, they were counted as having 3 semesters for that calendar year.
- Semesters needed start dates of at least 30 days apart to count as separate semesters. For example, if a student began a semester at a community college on August 15th, and began at an online University on August 31st, it was counted as the same semester.

Retention: Retention was defined as attending at least three semesters of college after high school. Therefore, if a student attended any institution of higher education for at least three semesters, they were given a status of *retained*. If a student attended two or fewer semesters, they were considered *not retained*.

Descriptive Statistics

Table 1. Demographic Makeup

	CT State Colleges	CT State Universities
Total Population	11,619	7,675
Percent Female	52%	56%
Percent Male	48%	44%
Percent Receiving Free/Reduced Price Lunch	52%	38%
Percent Asian	4%	4%
Percent Black or African American	16%	15%
Percent Hispanic/Latinx of any race	26%	15%
Percent White	50%	63%
Percent Other or Unknown Ethnicity	4%	3%

Table 2. Mean Predictor and Outcome Variables

	CT State Colleges		CT State Universities	
Metric	Mean	Standard Deviation	Mean	Standard Deviation
SAT-M	471	93.30	508	79.47
SAT-ERW	493	89.88	531	76.23
HS GPA	2.73	0.70	3.05	0.53
First-Year Math GPA	2.22	1.33	2.29	1.26
Average Number of FY Math Courses Taken	1.4	0.55	1.6	0.63
First-Year English GPA	2.39	1.24	2.87	1.06
Average Number of FY English Courses Taken	1.7	0.73	1.4	0.67
College Semesters Attended within 2 Yrs of HS Graduation	3.01	1.47	3.5	1.17
Percent Retained	65%	0.48	84%	0.36

FINDINGS

1. HSGPA was more highly correlated with First-Year GPAs and Semesters Attended than SAT scores were. This held true within ethnicity subgroups, and for both types of institutions.

Correlations were run for predictor variables against the college outcomes FYMGPA (table 3), FYEGPA (table 4) and number of college semesters attended (table 5). The correlations are first shown for the entire population, and to the right, broken down by ethnicity. Note that four ethnicities, Asian, Black, Hispanic, and White, are displayed. Other ethnicities did not have large enough group sizes for significance testing.

For CCC students, the correlations between HSGPA and FYMGPA and FYEGPA were .50 and .43 respectively, indicating robust correlations. SAT-M had a correlation of .37 with FYMGPA, and SAT-ERW had a correlation of .20 with FYEGPA.

Similarly, for CSU students, HSGPA's correlation to First-Year GPAs was robust, at .45 and .41 for FYMGPA and FYEGPA, respectively. SAT scores lagged behind in terms of correlation to First-Year GPAs, with correlations of .34 for SAT-M vs. FYMGPA and .16 for SAT-ERW vs. FYEGPA.

Table 3. Correlations of Predictors to First-Year Math GPA

Population	Predictor	All Students	Asian students	Black Students	Hispanic Students	White Students
CT State Colleges	SAT-M	0.37***	.041***	0.26***	0.26***	0.36***
	HSGPA	.50***	0.51***	0.43***	0.47***	0.50***
CT State Universities	SAT-M	.34***	0.38***	0.19***	0.28***	0.31***
	HSGPA	.45***	0.46***	0.36***	0.35***	0.48***

Note. *Significance denoted as follows:* ***p < .001; **p < .01; * p < . 05; †p < .10

Table 4. Correlations of Predictors to First-Year English GPA

Population	Predictor	All Students	Asian students	Black Students	Hispanic Students	White Students
CT State Colleges	SAT-ERW	.20***	0.20**	0.19***	0.17***	0.14***
	HSGPA	.43***	0.46***	0.43***	0.41***	0.41***
CT State Universities	SAT-ERW	.16***	0.20**	0.09*	0.06	0.11***
	HSGPA	.41***	0.48***	0.35***	0.35***	0.41***

Note. *Significance denoted as follows:* ***p < .001; **p < .01; * p < . 05; †p < .10

In table 5, correlations between the predictor variables to the number of semesters attended were not as strong as the correlations to FYMGPA or FYEGPA. However, a similar trend for the number of semesters outcome variable emerged, in which HSGPA was a stronger correlate than were either SAT-M or SAT-ERW for students overall. This was also the case for nearly all of the institution type by ethnicity subgroups. Indeed, while HSGPA's correlation was at least marginally significant to Semesters Attended for all cells, neither SAT-M or SAT-ERW was correlated with number of semesters for Black students attending a CSU, and SAT-ERW's relationship to semesters attended also missed significance for Asian, Back, and White students.

Table 5. Correlations of Predictors to Number of Semesters Attended

Population	Predictor	All Students	Asian students	Black Students	Hispanic Students	White Students
CT State Colleges	SAT-M	0.21***	0.23***	0.14***	0.15***	0.15***
	SAT-ERW	0.20***	0.15*	0.16***	0.16***	0.13***
	HSGPA	0.28***	0.23***	0.28***	0.24***	0.25***
CT State Universities	SAT-M	0.08***	0.15†	0.00	0.08†	0.04†
	SAT-ERW	0.06**	0.03	0.03	0.11*	-0.02
	HSGPA	0.13***	0.15†	0.07†	0.20***	0.09***

Note. *Significance denoted as follows:* ***p < .001; **p < .01; * p < . 05; †p < .10

2. **There were not clear-cut ethnicity differences in how strongly SAT was related to college outcomes.**

Next, we sought to investigate the trend found by some prior research, which suggests that SAT scores are better predictors of success for White students than Black and Hispanic students. First, for FYMGPA at CT State Colleges, SAT scores do appear more highly correlated for Asian and White students compared to Black and Hispanic students. The trend is similar at CT State Universities (see table 3 above).

However, for the other two outcome variables, FYEGPA and number of semesters attended, the results were more mixed in terms of clear ethnicity differences in the strength of associations. In some cases, Black and Hispanic students had *higher* correlation coefficients than Asian and White students, such as in the case of the relationship between SAT-ERW and number of semesters attended for CCC students.

Therefore, while there is some evidence that SAT-M scores better predict FYMGPA for Asian and White students than for Black and Hispanic students, that trend does not hold for predicting FYEGPA or number of semesters attended.

3. **While holding other factors constant, HSGPA remained a better predictor of college success than SAT scores. However, SAT scores, particularly SAT-M, still added some predictive value.**

The raw correlations presented in tables 3-5 show a straightforward trend in which HSGPA had stronger associations to college outcomes than did SAT scores. However, there is value in conducting multiple regression, where predictor values can be controlled for one another while determining a unique relationship to an outcome variable.[14] As such, six regression models were run, with each academic quality entered as predictors along with demographic variables. The models are:

1. Model 1: Predicting FYMGPA for CT State Colleges.
2. Model 2: Predicting FYMGPA for CT State Universities.
3. Model 3: Predicting FYEGPA for CT State Colleges.
4. Model 4: Predicting FYEGPA for CT State Universities.
5. Model 5: Predicting Retention for CT State Colleges.
6. Model 6: Predicting Retention for CT State Universities.

Table 6. Models 1-4: Linear Regression Models Predicting College GPA Outcomes

Regression Model: Outcome = ethnicity + gender + FRPL + SAT-ERW + SAT-M + HSGPA

	Standardized Regression Coefficients									Model Fit Statistics			
	Ethnicity = Asian	Ethnicity = Black	Ethnicity = Hispanic	Ethnicity = White	Gender = Female	FRPL = Yes	SAT-M	SAT-ERW	HSGPA	N	F-value	p-value	R-Square
Model 1: FYMGPA in CCC students	0.02	-.06**	0.00	-0.02	.08***	-.03*	.18***	0.02	.39***	8350	388.39	< .0001	0.295
Model 2: FYMGPA in CSU students	0.02	-0.03	-0.01	0.02	.08***	-0.02	.21***	.04**	.36***	6708	271.15	< .0001	0.267
Model 3: FYEGPA in CCC students	0.02	-0.02	0.00	0.03	.05***	-.04**	0.02	.05**	.39***	8670	240.81	< .0001	0.200
Model 4: FYEGPA in CSU students	.05*	-0.02	0.01	0.06	.11***	-.03*	.06**	0.00	.36***	5080	131.52	<.0001	0.189

Note. *Significance of regression coefficients denoted as follows:* ***p < .001; **p < .01; * p ≤ .05; †p < .10

Table 7. Models 5-6: Logistic Regression Models Predicting Retention

Regression Model: Retention = ethnicity + gender + FRPL + SAT-ERW + SAT-M + HSGPA

	Standardized Regression Coefficients									Model Fit Statistics		
	Ethnicity = Asian	Ethnicity = Black	Ethnicity = Hispanic	Ethnicity = White	Gender = Female	FRPL = Yes	SAT-M	SAT-ERW	HSGPA	N	Pseudo R^2	Percent Concordant
Model 5: Retention in CCC students	0.03	-0.01	-0.02	0.03	.06***	-.11***	.09***	0.00	.23***	11619	0.09	68%
Model 6: Retention in CSU students	-0.03	-0.04	-0.02	0.03	.05*	-.07*	.10**	-0.05	.13***	7675	0.04	62%

Note. *Significance of regression coefficients denoted as follows:* ***p < .001; **p < .01; * p ≤ .05; †p < .10

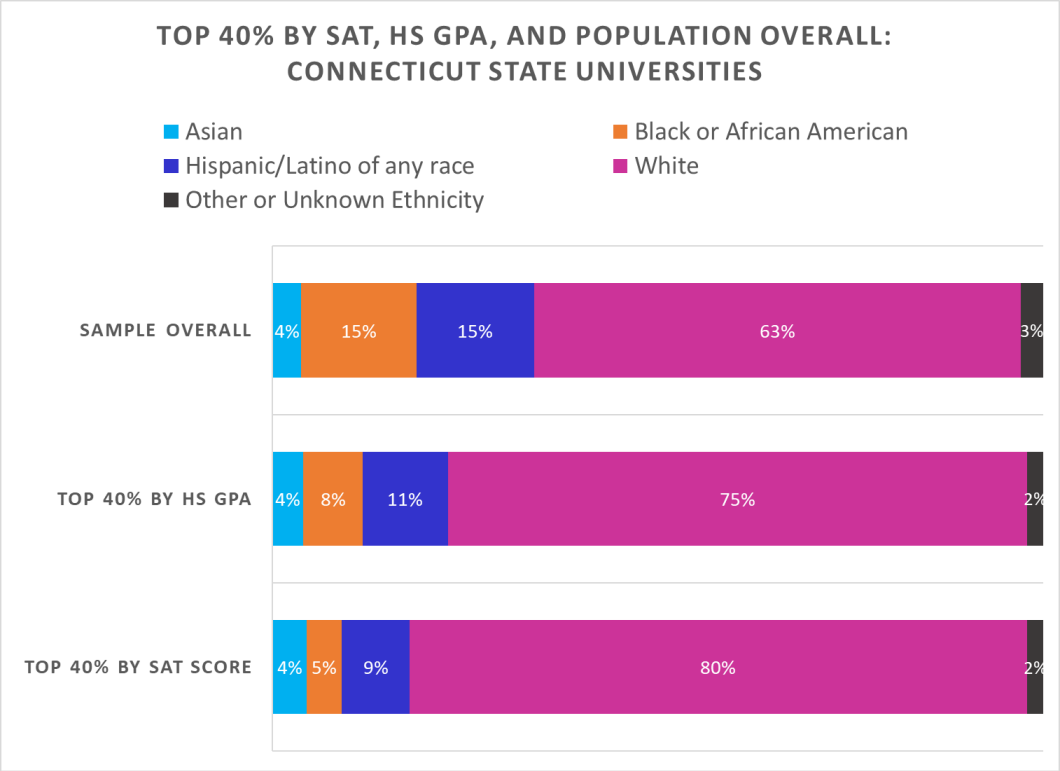
Tables 6 and 7 provide the standardized regression coefficients for each predictor in the models. Standardized, rather than raw, coefficients are presented so that the relative contributions of each factor can be considered. This is because standardized coefficients are adjusted to be on a common scale.

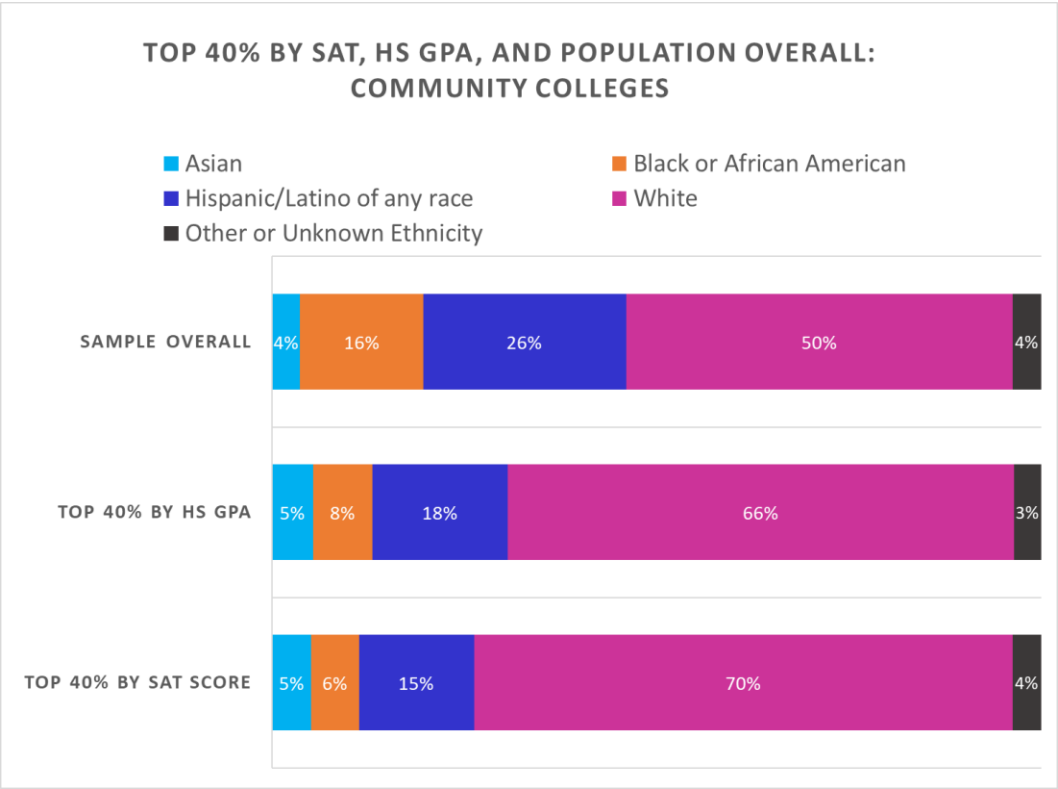
As shown in tables 6 and 7, HSGPA emerges as the factor with the most predictive weight in each model, while controlling for all other factors. Being female emerged as a significant positive predictor in all six models, and SAT-Math score was a significant predictor in all but one of the models, as did FRPL status. SAT-ERW was a significant predictor in only two models (predicting FYMGPA in CSU students and predicting FYEGPA in CCC students). Ethnicity had limited contribution to the models.

4. Using HSGPA as a cutoff measure may provide a slightly more equitable way to group samples.

It is conceivable that decisions of course placement or admission to a given major may be conducted by selecting some top quantile of students. In our final analysis, we considered a hypothetical scenario in which the top two quintiles of students were selected. We used the arbitrary cutoff of the top 40% of students, and we aimed to investigate the demographic makeup of the top students when using first (a) the HSGPA metric to group the students, and second (b) SAT scores as the grouping metric.

The figures below present the breakdown by ethnicity of students in (a) the sample overall, (b) the top 40% by HSGPA, and (c) the top 40% by SAT combined score. Figure 1 shows CT State College students, and figure 2 shows CT State University students. As seen in the figures, using HSGPA to select the top 40% of students provides a demographic makeup that is slightly closer to the sample overall than using SAT scores. Specifically, using HSGPA to choose the top 40% results in slightly more Black and Hispanic students represented than using SAT scores, and reduces the overrepresentation of White students.


TOP 40% BY SAT, HS GPA, AND POPULATION OVERALL: CONNECTICUT STATE UNIVERSITIES
Asian
Black or African American
Hispanic/Latino of any race
White
Other or Unknown Ethnicity
SAMPLE OVERALL
4%
15%
15%
63%
3%
TOP 40% BY HS GPA
4%
8%
11%
75%
2%
TOP 40% BY SAT SCORE
4%
5%
9%
80%
2%


TOP 40% BY SAT, HS GPA, AND POPULATION OVERALL: COMMUNITY COLLEGES
Asian
Black or African American
Hispanic/Latino of any race
White
Other or Unknown Ethnicity
SAMPLE OVERALL
4%
16%
26%
50%
4%
TOP 40% BY HS GPA
5%
8%
18%
66%
3%
TOP 40% BY SAT SCORE
5%
6%
15%
70%
4%

DISCUSSION

In the current study, the relationship between selected academic quality metrics and early college outcomes in a recent cohort of Connecticut public high school graduates was investigated. We found that HSGPA was more highly correlated with college Math and English GPAs, as well as number of college semesters attended, than were either SAT-M or SAT-ERW. This trend was found for students of CT State Colleges as well as CT State Universities, and within the ethnicity subgroups studied. In other words, HSGPA was the most strongly correlated metric with college outcomes, not only for the majority-White population overall, but also for Asian, Black and Hispanic groups taken separately.

Furthermore, when the predictor variables SAT-ERW, SAT-M, and HSGPA were entered into regression models to investigate their relationship with college outcomes, HSGPA showed superiority in terms of its predictive weight, even while holding the other predictor variables constant. In each of six models, HSGPA was the strongest predictor for determining retention as well as First-Year Math and English GPAs. However, SAT-M remained a significant predictor in most models, surpassing SAT-ERW, but not HSGPA, in its predictive power.

Pre-college quality metrics like SAT scores and HSGPA can have far-reaching ramifications for a student's college and post-college outcomes. As such, it is crucial that advising, admissions, and other college staff have up-to-date information on the relative utility of each metric. Given not only the better predictive value of HSGPA, but also the trend for its upper echelons to have a slightly more equitable ethnicity distribution compared to the distribution of SAT scores, we suggest that HSGPA be given preference as an academic quality metric. However, given the lesser, but still significant, predictive value of SAT-M scores (and in some cases, SAT-ERW scores), those may have value in a secondary capacity to HSGPA.

Despite the strong statistical relationship between HSGPA and first-year college outcomes, we urge readers not to assume that students with below-average GPAs in high school will necessarily be unsuccessful in college. Indeed, many students in the population with below-average HSGPAs still went on to do well in their first-year math and English courses and were retained for a second year of college. Given the far-reaching benefits of a college education,[15] it is not our intention to use data to dissuade certain students from obtaining a college education. Instead, we seek to inform practitioners about the relative usefulness of certain high school quality indicators, and we suggest that students' educational options be evaluated on a case-by-case basis, with additional factors to HSGPA and SAT scores considered.

Future research of Connecticut students should be expanded to include more years of data, so that the relationship between pre-college quality metrics and later outcomes, such as college graduation and subsequent income, can be investigated.

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